

DOCUMENT 1
Declaration of Brandye Hendrickson

IN THE UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF TEXAS
LUBBOCK DIVISION

STATE OF TEXAS AND
TEXAS DEPARTMENT OF
TRANSPORTATION,

Plaintiffs,

V.

U.S. DEPARTMENT OF
TRANSPORTATION, FEDERAL
HIGHWAY ADMINISTRATION,
PETE BUTTIGIEG, in his official
capacity as SECRETARY OF
TRANSPORTATION, and
SHAILEN BHATT, in his official
capacity as ADMINISTRATOR OF
THE FEDERAL HIGHWAY
ADMINISTRATION,

Civil Action No. 5:23-cv-304

Defendants.

DECLARATION OF BRANDYE HENDRICKSON

I, Brandye Hendrickson, hereby declare as follows:

1. I am the Deputy Executive Director for Planning and Administration of the Texas Department of Transportation (TxDOT). I have held this position since July 2021.
2. Based on my position, I have personal knowledge and experience to understand the effect the U.S. Department of Transportation (DOT) and Federal Highway Administration's (FHWA) (together, Agencies) *National Performance Management Measures; Assessing Performance of the National Highway System, Greenhouse Gas Emissions Measure*, published on December 7, 2023 (hereinafter "the Final Rule") will have on TxDOT's operations and ability to focus on its core mission.

3. The Final Rule creates an administrative burden on TxDOT because it unnecessarily increases both the monetary and labor hours needed for establishing and adjusting the declining targets, reporting on the progress towards a declining target, and developing plans to achieve a declining target. The Agencies recognize these burdens and have already identified an estimate of the costs to comply with the Final Rule found in the Regulatory Impact Analysis (RIA) that accompanied the proposed rule in 2022. As a response to comments in the preamble of the Final Rule, the Agencies determined that the RIA cost estimates should be primarily unchanged. 88 Fed. Reg. 85,388. TxDOT should not have to expend these additional resources to comply with the Final Rule, which exceeds the Agencies' statutory authority. Moreover, TxDOT also suffers by having to divert these resources from other activities.

4. The Final Rule would also have transformative effects on Texans in order to achieve declining targets. Texas still continues to grow both in population and economic activities which fuels the demand for freight distribution.¹ Texas has the second largest economy in the U.S. and ranks as the 9th largest economy in the world.² An integral piece supporting this economy is a robust, and expanding, freight distribution across the state. All industries depend on the movement of goods and it is vital this movement is not hindered or there will be effects to the economy and Texans' quality of life. Texas already does not have a fully built roadway transportation system and there is a need to continue adding lane mile capacity to address population growth and congestion.³ Texas also has major national and international ports and airports that must respond to the market demand of freight distribution traveling through Texas. For example, long-haul freight is expected to increase 40% by 2040.⁴ Annually, trucks carry 1.5 billion tons of freight worth \$1.2 trillion to, from, and within Texas.⁵ And another 195 million tons of freight worth \$664 billion pass through Texas.⁶ These figures will only increase with trucks remaining as the dominant mode of freight distribution.⁷ It is forecasted that trucks will carry \$3.7 billion tons of freight worth \$3.7 trillion by 2050.⁸ Specifically in TxDOT's Lubbock District, freight

¹ TxDOT, Texas Delivers 2050: Texas Freight Mobility Plan, March 2023, p. 1-2, found at <https://www.txdot.gov/projects/planning/freight-planning/texas-delivers-2050.html> (Texas Delivers).

² Texas Delivers, p. 1.

³ Texas ranks 35th in lane miles per VMT; 33rd in lane miles per land area; and 34th in lane miles per population. *See* TxDOT's comment letter to the Proposed Rule, p. 16.

⁴ USGCRP, National Climate Assessment 2018, Chapter 12 Transportation, page 483.

⁵ TxDOT, The Economic Role of Freight in Texas, May 2021, found at <https://www.txdot.gov/government/partnerships/freight-planning/economic-role-freight.html>; *see also* Texas Delivers, p. 28-29.

⁶ TxDOT, The Economic Role of Freight in Texas, May 2021

⁷ Texas Delivers, p. 28-29, 35.

⁸ *Id.*

plays an important role in the economy in the form of 290,000 jobs and \$23.7 billion in gross regional product.⁹ In order to support freight distribution, TxDOT will need to continue to enhance Texas's vast highway network. Without freight, the Texas economy would come to a stop.¹⁰ The actions necessary to attempt to achieve any declining target that may be imposed by the Final Rule, to the extent TxDOT has authority, would result in incalculable costs borne by all Texans. These are the burdens and costs the Agencies have not taken into account when promulgating the Final Rule.

I declare under penalty of perjury that the foregoing is correct. Executed on this 16th day of January, 2024 in Austin, Texas.

DocuSigned by:

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Brandye Hendrickson

⁹ TxDOT, The Economic Role of Freight in the Lubbock District, 2021, found at <https://ftp.dot.state.tx.us/pub/txdot/move-texas-freight/resources/economic-role-freight/freight-lubbock.pdf>.

¹⁰ TxDOT, The Economic Role of Freight in Texas, 2021, found at <https://ftp.dot.state.tx.us/pub/txdot/move-texas-freight/resources/economic-role-freight/economic-role-freight-texas.pdf>.

DOCUMENT 2
Summary Report
Economic Assessment:
National Performance Management Measures;
Assessing Performance of the National Highway
System, Greenhouse Gas Emissions Measure

Summary Report

Economic Assessment:

National Performance Management Measures; Assessing Performance of the National Highway System, Greenhouse Gas Emissions Measure

RIN 2125-AF99

Proposed Rule

June 2022

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1. Executive Summary

Executive Order (E.O.) 12866, Regulatory Planning and Review (58 FR 51735, October 4, 1993), as supplemented by E.O. 13563, Improving Regulation and Regulatory Review (76 FR 3821, January 21, 2011), directs each Federal agency to propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. The U.S. Department of Transportation's (DOT) Federal Highway Administration (FHWA) is presenting this Regulatory Impact Analysis (regulatory analysis or RIA) to support a Notice of Proposed Rulemaking (NPRM) to establish a measure on the percent change in tailpipe carbon dioxide ds the reference year (defined as calendar year 2021) on the National Highway System (NHS) (also referred to as the Greenhouse Gas (GHG) measure). This proposed measure would build on a series of rules establishing performance measures for State Departments of Transportation (State DOT) and Metropolitan Planning Organizations (MPO) to use in assessing and reporting performance.

FHWA previously established a GHG performance measure in a final rule published on January 18, 2017 (82 FR 5971) (PM3 final rule). FHWA repealed the GHG measure in a final rule published on May 31, 2018 (83 FR 24920), after a notice-and-comment process. In response to policies set forth in sections 1 and 2 of E.O. 13990 (Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis) and E.O. 14008 (Tackling the Climate Crisis at Home and Abroad) in January 2021, this proposed rule would establish a GHG measure.

The Office of Management and Budget (OMB) has determined that the proposed rule would be designated a significant regulatory action within the meaning of E.O. 12866 because it may raise novel legal or policy issues arising out of the President's priorities. However, FHWA anticipates that the proposed rule would not be economically significant for purposes of E.O. 12866. The proposed rule would not have an annual effect on the economy of \$100 million or more. The proposed rule would not adversely affect, in a material way, the economy, any sector of the economy, productivity, competition, or jobs. In addition, the proposed rule would not interfere with any action taken or planned by another agency and would not materially alter the budgetary impact of any entitlements, grants, user fees, or loan programs. This regulatory analysis estimates the economic impact of the proposed rule in terms of costs that would be incurred by Federal, State, and local governments, and discusses the potential benefits as required by E.O. 12866 and E.O. 13563. This action complies with E.O. 12866, E.O. 13563, and DOT regulatory policies and procedures.¹

Purpose of Regulation

The proposed rule that this RIA assesses follows a series of related rules that established a set of performance measures for State DOTs and MPOs to use as required by the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act. In the last of that series of rules, published on January 18, 2017, FHWA established a measure on the percent change in tailpipe CO₂ emissions on the NHS from the reference year 2017. Subsequently, FHWA published a final rule repealing the GHG measure on May 31, 2018 (83 FR 24920). This proposed rule would establish a GHG measure similar to the measure established in 2017 but would update associated requirements. Specifically, the proposed measure would address the percent change in tailpipe CO₂ emissions on the NHS from the reference year (defined as calendar year 2021). This

¹ See DOT Order 2100.6A, "Rulemaking and Guidance Procedures" (June 7, 2021).

proposed rule also would require State DOTs and MPOs to set improving targets for reducing tailpipe CO₂ emissions on the NHS. In addition, this proposed rule would require certain MPOs serving urbanized areas (UZA) to establish additional joint 4-year UZA targets when the metropolitan planning area boundaries of two or more MPOs overlap any portion of an UZA that contains mainline highways on the NHS.

MAP-21² (Pub. L. 112-141) established new requirements for performance management to ensure the most efficient investment of Federal transportation funds. The FAST Act³ (Pub. L. 114-94) continued these requirements. Performance management increases the accountability and transparency of the Federal-aid highway program and provides a framework to support improved investment decision-making by State DOTs and MPOs through a focus on performance outcomes for key national transportation goals.

As part of this framework, FHWA issued three related national performance management measure rules^{4, 5, 6} that established a set of performance measures for State DOTs and MPOs to use to assess performance. The performance measures are in 12 areas⁷ generalized as follows: (1) serious injuries per vehicle miles traveled (VMT); (2) fatalities per VMT; (3) number of serious injuries; (4) number of fatalities; (5) pavement condition on the Interstate System; (6) pavement condition on the non-Interstate NHS; (7) bridge condition on the NHS; (8) performance of the Interstate System; (9) performance of the non-Interstate NHS; (10) freight movement on the Interstate System; (11) traffic congestion; and (12) on-road mobile source emissions.

In the NPRM for the third performance measure rule (81 FR 23806, Apr. 22, 2016), FHWA sought comment on whether and how to establish a CO₂ emissions measure. The PM3 final rule⁸ established a measure to assess the performance of the NHS with respect to GHG emissions under the National Highway Performance Program (NHPP), which was the percent change in CO₂ emissions on the NHS from calendar year 2017. However, the measure was later repealed. 83 FR 24920 (May 31, 2018).

FHWA initiated this proposed rule in response to section 1 of E.O. 13990, which establishes a National Policy to reduce GHG emissions, and E.O. 14008, which calls for a Government-wide approach that reduces climate pollution in every sector of the economy and calls on the Federal Government to drive assessment, disclosure, and mitigation of such pollution. The transportation sector represents the largest source of CO₂ emissions in the United States and

² Moving Ahead for Progress in the 21st Century Act (MAP-21): <https://www.gpo.gov/fdsys/pkg/PLAW-112publ141/html/PLAW-112publ141.htm>

³ Fixing America's Surface Transportation Act (FAST Act): <https://www.gpo.gov/fdsys/pkg/PLAW-114publ94/html/PLAW-114publ94.htm>

⁴ First performance measure final rule: "National Performance Management Measures: Highway Safety Improvement Program" (RIN 2125-AF49): <https://www.gpo.gov/fdsys/pkg/FR-2016-03-15/pdf/2016-05202.pdf>

⁵ Second performance measure final rule: "National Performance Management Measures: Assessing Pavement Condition for the National Highway Performance Program and Bridge Condition for the National Highway Performance Program" (RIN 2125-AF53): <https://www.gpo.gov/fdsys/pkg/FR-2017-01-18/pdf/2017-00550.pdf>

⁶ PM3 final rule: "National Performance Management Measures: Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program" (RIN 2125-AF54): <https://www.gpo.gov/fdsys/pkg/FR-2017-01-18/pdf/2017-00681.pdf>

⁷ These areas are listed within 23 U.S.C. 150(c), which requires the Secretary to establish measures to assess performance or condition.

⁸ Final Rule on "National Performance Management Measures: Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program" (RIN 2125-AF54): <https://www.gpo.gov/fdsys/pkg/FR-2017-01-18/pdf/2017-00681.pdf>

is expected to remain so through 2050.⁹ Establishment of a GHG measure in FHWA's Transportation Performance Management program would result in information that could better inform the future investment decisions of the Federal government, State DOTs, and MPOs towards achieving that goal. Establishment of improving targets for the proposed measure also would help State DOTs and MPOs reduce GHG emissions consistent with national, State, and local goals.

The Proposed GHG Performance Measure

FHWA regulations at 23 CFR Part 490 include the national performance management measures that the proposed rule would update to include a GHG measure. The following are brief descriptions of the relevant sections of the existing regulations as they relate to the proposed GHG Measure.

Section 490.101: Definitions

The proposed rule includes a new definition for the Fuels and Financial Analysis System – Highway (FUELS/FASH), which would provide fuel use data to support the calculation of the GHG metric under Section 490.511.

Section 490.105: Establishment of Performance Targets

The proposed rule would require State DOTs and MPOs to establish targets to assess progress on the GHG measure identified in section 490.105(c)(5). Those targets would need to meet the requirements of 23 CFR 490.105, and they would need to be improving targets for reducing tailpipe CO₂ emissions on the NHS. State DOTs would be required to establish their initial targets no later than October 1, 2022, which would synchronize the GHG measure with the reporting cycle in 23 CFR Part 490 for other NHPP measures. In addition, the proposed rule would require that certain MPOs serving urbanized areas establish a single joint target for each urbanized area that contains mainline highways on the Interstate or Non-Interstate NHS, and that is overlapped by the boundaries of two or more metropolitan planning areas.

Section 490.107: Reporting on Performance Targets

The proposed rule would require State DOTs to include the proposed GHG measure in biennial performance reports submitted to FHWA to meet the requirements of 23 U.S.C. 150(e) and 23 CFR 490.107. The reports would also include metric calculations of tailpipe CO₂ emissions for the NHS and all roads. MPOs would also be required to report baseline condition/performance and progress toward the achievement of their targets in the system performance report in the metropolitan transportation plan. MPOs would also be required to report to the State DOT their metric calculation method, along with their metric calculations of tailpipe CO₂ emissions for the NHS and all roads.

⁹ U.S. Environmental Protection Agency. 2020. U.S. Greenhouse Gas Emissions and Sinks 1990-2018. Available online at: <https://www.epa.gov/sites/production/files/2020-04/documents/us-ghg-inventory-2020-main-text.pdf>

Section 490.109: Assessing Significant Progress Toward Achieving the Performance Targets for the National Highway Performance Program and the National Highway Freight Program

The proposed rule would require FHWA to determine if State DOTs have achieved or are making significant progress toward achieving the State targets for the GHG measure. FHWA would evaluate each State DOT's progress toward achieving their targets using the reported GHG metric data in the State Biennial Performance Reports, as described in 23 CFR 490.109(d)(1)(v) and (vi). If FHWA determines a State DOT has not made significant progress toward its target for the proposed GHG measure, the State DOT would be required to document the actions the State DOT would undertake to achieve its target.

Section 490.503: Applicability

The GHG measure established under the proposed rule would be applicable to all mainline highways on the Interstate or non-Interstate NHS.

Section 490.505: Definitions

The proposed rule includes a definition for the term “greenhouse gas”, as well as a definition for the term “reference year”, which is calendar year 2021 for the purpose of the GHG measure.

Section 490.507: National performance management measures for system performance

The proposed rule would establish a GHG emissions measure to address system performance. The proposed measure is the percent change in tailpipe CO₂ emissions on the NHS compared to the reference year 2021.

Section 490.509: Data requirements

In support of the proposed rule, FHWA would post on its website information needed to calculate the GHG metric for the GHG measure. This information would include the total number of gallons of fuel consumed by fuel type, annual total vehicle-miles traveled (VMT) from HPMS, and a CO₂ factor for each on-road fuel type used to calculate the metric.

Section 490.511: Calculation of System Performance Metrics

The proposed GHG performance measure would be based on a metric for Annual Total Tailpipe CO₂ Emissions on the NHS. States would use fuel use data from FHWA's Fuels and Financial Analysis System-Highways (FUELS/FASH) system, CO₂ emissions factors posted by FHWA, and Vehicle Miles Traveled (VMT) data from the Highway Performance Monitoring System (HPMS). States would calculate the metric for each calendar year by first multiplying fuel use for each fuel type by the CO₂ emissions factors provided by FHWA, resulting in a calculation of total tailpipe CO₂ emissions on all roads. They would then multiply this estimate by the fraction of total Statewide VMT occurring on NHS facilities. State DOTs would need to calculate this metric and report it to FHWA in Biennial Performance Reports, as described in 23 CFR 490.107. MPOs would be granted flexibility in how they calculate the GHG metric,

provided the method is demonstrated to have valid and useful results and is agreed upon by the State DOT.

Section 490.513: Calculation of System Performance Measures

The proposed rule would specify the method to be used to calculate the GHG performance measure using the performance data. The measure would be expressed as a percent change in tailpipe CO₂ emissions from the reference year, which the proposed rule would define as calendar year 2021.

Estimated Costs of this Proposed Rule

This proposed rule would result in costs for State DOTs and MPOs that would need to set targets for the GHG measure, report on those targets, report on actions to be taken by those States that do not meet their targets for the GHG measure, prepare the GHG performance metric, and calculate the GHG performance measure. To estimate the costs of this proposed rule, FHWA assessed the level of effort that would be needed to comply with each applicable section in 23 CFR Part 490 with respect to the GHG measure. These costs are expressed in labor hours and the labor categories for those needed to implement the GHG measure. Level of effort by labor category is monetized with loaded wage rates to estimate total costs. Federal costs associated with implementation of the GHG measure are expected to be absorbed through existing programs and data collection systems and are therefore not reflected in this analysis.

Table 1 displays the total costs of this proposed rule for the 10-year study period (2022–2031). Total costs are estimated to be \$11.0 million, discounted at 7 percent, and \$12.9 million discounted at 3 percent.

Table 1: Total Costs of the Proposed Rule (in 2020 Dollars)

Cost Components	10-Year Total Cost		Annualized Cost	
	7%	3%	7%	3%
Section 490.105 - 490.109 - Reporting Requirements	\$9,948,979	\$11,610,925	\$1,416,511	\$1,361,155
Establish and Adjust GHG Targets	\$7,442,122	\$8,615,050	\$1,059,591	\$1,009,947
Report on GHG Targets & Progress Toward Targets	\$2,272,480	\$2,704,007	\$323,550	\$316,992
Develop and Report Plan to Achieve GHG Targets	\$234,377	\$291,868	\$33,370	\$34,216
Section 490.511 - Calculation of System Performance Metrics	\$1,049,938	\$1,245,987	\$149,488	\$146,068
Calculate Annual Total Tailpipe CO ₂ Emissions	\$1,049,938	\$1,245,987	\$149,488	\$146,068
Section 490.513 - Calculation of System Performance Measures	\$23,918	\$30,579	\$3,405	\$3,585

Calculate % Change in Tailpipe CO ₂ Emissions the NHS Compared to the reference year	\$23,918	\$30,579	\$3,405	\$3,585
Total Cost of Final Rule	\$11,022,835	\$12,887,491	\$1,569,404	\$1,510,807

Note: Totals may not add due to rounding.

Benefits of this Proposed Rule

Together with the other existing performance measures, the proposed GHG measure included in this rule could promote greater efficiency by assuring that GHG emissions are consistently and collaboratively considered by State DOTs and MPOs through transportation planning and performance management. Inclusion of a GHG measure could also promote greater efficiency in the allocation of transportation funds since investment decisions would be more likely to consider GHG emissions as a factor in evaluating projects, rather than focusing on a narrower set of decision criteria. In addition, the proposed rule's reporting requirements is expected to increase States' accountability for their decision-making by providing more transparent performance reporting on their efforts to reduce CO₂

However, the proposed rule provides for no increase in funds for transportation projects. Thus, the rule may result in some offsetting loss of benefits from investment projects that would no longer be pursued, if funds are shifted toward other projects as a result of the rule. In addition, it is not possible to conclude with any degree of certainty whether and how the GHG measure might cause State DOTs and MPOs to make transportation-investment and operations decisions that they otherwise would not have made.

2. Introduction

Section 2 of Executive Order (E.O.) 13990 of January 20, 2021 (Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis) directs the heads of all agencies to review all agency actions taken between January 20, 2017 and January 20, 2021, and to take steps to rescind measures inconsistent with the National Policy stated in section 1 of the E.O., including to reduce GHG emissions. Additionally, E.O. 14008 of January 27, 2021 (Tackling the Climate Crisis at Home and Abroad) calls for ambitious actions to address climate change, including a Government-wide approach. E.O. 14008 calls on the Federal Government to drive assessment, disclosure, and mitigation of climate pollution. The transportation sector represents the largest source of CO₂ emissions in the United States and is expected to remain so through 2050.¹⁰

This proposed rule to establish a method for the measurement and reporting of certain GHG emissions associated with transportation under Title 23 of the United States Code (GHG measure) responds to sections 1 and 2 of E.O. 13990 and E.O. 14008. It is proposed as an addition to existing FHWA regulations codified at 23 CFR Part 490 that establish a set of performance measures for State departments of transportation (State DOTs) and Metropolitan Planning Organizations (MPOs) to use.

¹⁰ U.S. Environmental Protection Agency. 2020. U.S. Greenhouse Gas Emissions and Sinks 1990-2018. Available online at: <https://www.epa.gov/sites/production/files/2020-04/documents/us-ghg-inventory-2020-main-text.pdf>

2.1. Background

In a final rule published on January 18, 2017 (82 FR 5970), FHWA previously included a similar measure requiring State DOTs and MPOs that have National Highway System mileage in their State geographic boundaries and metropolitan planning area boundaries, respectively, to establish targets for carbon dioxide (CO₂) emissions generated by on-road mobile sources relative to the reference year 2017, and to report on their progress in meeting the targets. Prior to implementing the GHG measure, after soliciting additional public comments, FHWA repealed the 2017 GHG measure in a final rule published on May 31, 2018 (83 FR 24920).

This proposed rule would establish a GHG measure in the performance management regulations found at 23 CFR Part 490.

2.2. Need for Regulatory Action

The proposed GHG measure would help implement the Federal policies described in sections 1 and 2 of E.O. 13990 and E.O. 14008. The GHG measure also would help State DOTs and MPOs achieve State and local GHG policies and targets. It would provide a consistent basis for estimating on-road GHG emissions and would aid States and MPOs in identifying and planning for GHG emissions trends and evaluating progress. Establishment of a GHG measure in FHWA's Transportation Performance Management program would require the calculation and reporting of information about on-road tailpipe CO₂ emissions that could inform the public and future investment decisions of the Federal government, State DOTs, and MPOs.

In addition, FHWA anticipates that the proposed rule would facilitate more consistent and reliable performance reporting at the national level with respect to the GHG measure. All entities collecting and reporting data associated with the proposed measure are public entities (e.g., State DOTs) and capture data in a format best suited for their own interests and needs, and typically do not account for the need for national consistency. Differences in data collection and reporting methods across State DOTs hinder accurate analysis at the national level as well as the measurement of progress toward the achievement of performance targets. Standardizing data collection and analysis on on-road tailpipe CO₂ emissions has the potential to improve the decision-making affecting the Nation's transportation infrastructure at all levels of government and allow for credible and reliable performance reporting at a national level.

2.3. Proposed Rule

This proposed rule would establish a GHG measure, which would require compliance with portions of 23 CFR 490.101, 490.105, 490.107, 490.109, 490.503, 490.505, 490.507, 490.509, 490.511, and 490.513. The following are brief descriptions of sections of the proposed rule that are presumed to involve implementation costs to State DOTs and MPOs. No costs were estimated for Sections 490.101, 490.503, 490.505, 490.507 and 490.509.

Section 490.105: Establishment of Performance Targets

In this section of the proposed rule, FHWA would require State DOTs and MPOs to establish improving targets for the GHG performance measure addressing the performance of the Interstate System and the performance of the NHS (excluding the Interstate System). State DOTs would be required to establish both a 2-year and 4-year target for the 4-year performance period. State DOTs would have the option to adjust their 4-year target at the midpoint of the performance period. Performance would be measured and evaluated to:

- Compare the actual 2-year and 4-year condition/performance with the reference year previously measured (i.e., baseline) condition/performance; and

- Compare the actual 2-year and 4-year condition/performance with reported 2-year and 4-year targets that represents intended condition/performance level at the midpoint and at the end of a performance period, respectively.

The MPOs would have the option to agree to the 4-year targets established by their State DOT or to establish improving targets specific to their metropolitan planning area. In addition, two or more MPOs with boundaries overlapping any portion of a single UZA that contains mainline highways on the Interstate or Non-Interstate NHS be required to set a joint 4-year urbanized area target for that UZA.

Section 490.107: Reporting on Performance Targets

Under the proposed rule, State DOTs would be required to submit biennial performance reports to FHWA for the proposed GHG measure starting in October 2022, and every 2 years thereafter. The reports would address the topics of target establishment, progress assessment, and other performance reporting requirements.

In the 1st Biennial Performance Report (i.e., Baseline Performance Period Report for the 1st performance period) due October 1, 2022, State DOTs would report the baseline condition/performance level for the proposed GHG measure, anticipated condition/performance level at the midpoint of the 1st performance period (i.e., 2-year target), anticipated condition/performance level at the end of the 1st performance period (i.e., 4-year target), and other information about State DOT established targets.

Beginning with the 2nd Biennial Performance Report (i.e., Mid Performance Period Progress Report for the 1st performance period) due October 1, 2024, State DOTs also would include an assessment of progress toward achieving the established targets for the proposed GHG measure reported in the Baseline Performance Period Report. States also have the option to adjust their 4-year targets. In this report, State DOTs will assess target-level progress based on:

- 2-year targets;
- The baseline condition/performance level established in the 1st Biennial Performance Report; and
- The current (or actual) condition/performance level at the midpoint of the 1st performance period.

In the 3rd Biennial Performance Report (i.e., Full Performance Period Progress Report for the 1st performance period) due in October 2026, State DOTs would include a State DOT progress evaluation of progress toward achieving the targets for the proposed GHG measure established in the Baseline Performance Period Report. In this report, State DOTs would assess target-level progress based on:

- 4-year targets;
- The baseline condition/performance level established in the Baseline Performance Period Report; and
- The current (or actual) condition/condition or performance level at the end of 1st performance period, which is equivalent to the baseline performance level of the 2nd performance period.

MPOs that choose to establish their own targets for the proposed GHG measure would report and document their established targets to the relevant State DOTs in a manner that is agreed upon by both parties. All MPOs would report baseline performance and progress toward the achievement of those targets in the system performance report in their metropolitan

transportation plan in accordance with 23 CFR part 450. In addition, all MPOs would report to their State DOTs a description of their GHG metric calculation method, described in proposed § 490.511(d), including the calculation of tailpipe CO₂ emissions for the NHS and all roads. Reporting of the metric calculation method and GHG metrics shall be done in a manner that is documented and mutually agreed upon by both the State DOT and the MPO.

Section 490.109: Assessing Significant Progress Toward Achieving the Performance Targets for the National Highway Performance Program

Under the proposed rule, FHWA would evaluate each State DOT's progress toward achieving GHG targets, based on GHG metric data reported in the State DOT's biennial performance reports. FHWA would make a determination at the midpoint and end of the performance period whether the State DOT is achieving or making significant progress toward the State DOT GHG target. When either the actual condition/performance level is better than the baseline condition/performance reported in the State DOT Baseline Performance Period Report or the actual condition/performance level is equal to or better than the State DOT's established GHG target, FHWA would determine that the State DOT made significant progress toward the achievement of its target for the GHG measure.

Existing Section 490.109(f)(1) states that if FHWA determines a State DOT has not made significant progress toward achieving the NHPP targets, then the State DOT would need to include as part of the next Biennial Performance Report a description of the actions the State DOT will undertake to achieve the targets related to the measure in which significant progress was not achieved. Section 490.109(f)(3) states that the State DOT should, within 6 months of the significant progress determination, amend its Biennial Performance Report to document the actions being taken to achieve targets. FHWA is not proposing specific penalties for failure to achieve performance targets. Failure to comply with Federal requirements, including requirements to set performance targets, may be subject to penalties under 23 CFR 1.36.

Section 490.511: Calculation of System Performance Metric

Under the proposed rule, the GHG measure would be based on Annual Total Tailpipe CO₂ Emissions on the NHS. Per 23 CFR 490.511(f), the Annual Total Tailpipe CO₂ Emissions on the NHS metric is calculated using State-level fuel use data from FHWA's Fuels and FASH system, CO₂ emissions factors for each fuel type, and VMT data from HPMS. For each fuel type, estimated fuel use is multiplied by CO₂ factor representing the amount of CO₂ released per unit of fuel consumed for each type of fuel. The total CO₂ emissions are then summed across fuel types. That total is then multiplied by the percentage of the NHS' share of VMT out of total State VMT on all public roads.

$$(\text{Tailpipe CO}_2 \text{ Emissions on NHS})_{CY} = \left(\sum_{t=1}^T (\text{Fuel Consumed})_t \times (\text{CO}_2 \text{ Factor})_t \right) \times \left(\frac{\text{NHS VMT}}{\text{Total VMT}} \right)$$

Section 490.513 Calculation of System Performance Measures

The proposed rule specifies the method to be used to calculate the performance measure for Percent Change in Tailpipe CO₂ Emissions on the NHS Compared to the reference year (defined as calendar year 2021) using the metric described in section 490.511.

MPOS would be granted flexibility in how they calculate the GHG metric under the proposed rule. MPOs would be allowed to calculate CO₂ based on their share of total Statewide VMT; based on the MOVES model; based on FHWA's Energy and Emissions Reduction Policy

Analysis Tool (EERPAT) model, or any other method that is demonstrated to have valid and useful results and is agreed upon by the State DOT.

3. Inputs, Populations, and Assumptions Used in the Analysis

This section describes in detail the sources, assumptions, and calculations used to derive the data inputs and key assumptions used to estimate the cost of the proposed rule in this RIA. Throughout this analysis, FHWA has made assumptions about the number of hours necessary to complete required activities for implementing the proposed GHG measure, as well as the number of entities that would be affected. The FHWA also requests comments from the public on the assumptions used to estimate the costs of the provisions included in this proposed rule.

To develop this analysis, FHWA used the information gathered from the numerous subject matter experts (SMEs) from FHWA for the development of a GHG measure as part of the National Transportation Performance Management program. These officials include professional or technical staff in the Office of Planning, Environment, and Realty and the Office of Infrastructure, among others. Through these SMEs, FHWA gathered qualitative information on data collection and analysis practices by State DOTs and MPOs. In addition, FHWA reviewed the public comments submitted in response to the previous PM3 rulemaking and to the 2018 rulemaking that resulted in the repeal of the 2017 GHG measure.¹¹ With this information, FHWA developed data inputs for this analysis on the type and amount of labor needed to comply with this proposed rule.

3.1. Fully Loaded Wages

Based on the information gathered, FHWA identified two labor categories of individuals who would be needed to implement the proposed GHG measure. Table 2 displays the labor types that are most likely to receive an incremental increase in workload (level of effort) due to implementation of the GHG measure under this proposed rule, as well as their 2019 wage rate, which is the most recent available wage data, and their 'loaded' wage rate.

The FHWA uses wage rate data from the Bureau of Labor Statistics (BLS)' Mean Hourly Wage Rate (May 2020) dataset.¹² Next, to prepare a "loaded" wage rate, FHWA adjusted the wage rates to reflect total compensation, which includes health and retirement benefits. The FHWA multiplies the ratio of total compensation¹³ to wages¹⁴ for all employees with each labor type wage rate to calculate a fully loaded wage rate. The FHWA calculated the loaded wage weight to be 1.56 for the public sector. The fully loaded wage rates displayed in Table 3 are used throughout this analysis.

To arrive at the cost of implementing the proposed GHG measure, FHWA multiplied each labor category's fully loaded wage rate by the estimated level of effort for compliance with

¹¹ Public comments submitted during the PM3 rulemaking are available at <https://www.regulations.gov/docket/FHWA-2013-0054> (Docket No. FHWA-2013-0054). Public comments submitted during the rulemaking to repeal the 2017 GHG measure are available at: <https://www.regulations.gov/docket/FHWA-2017-0025> (Docket No. FHWA-2017-0025).

¹² BLS May 2020 National Occupational Employment and Wage Estimates – United States: https://www.bls.gov/oes/current/oes_nat.htm#13-0000

¹³ BLS Employment Cost Index, 2020 Average Series: <https://www.bls.gov/news.release/eci.nr0.htm>

¹⁴ BLS Employment Cost Index, 2020 Average Series: <https://www.bls.gov/news.release/eci.nr0.htm>

each regulatory section related to the proposed GHG measure for which FHWA assumed associated costs.

Table 2: Wage Rate Inputs (in 2020 Dollars)

Labor Category	2020 Wage Rate (\$ / hour)	Loaded Wage Weight	2020 Loaded Wage Rate
	A	B	c = a * b
General and Operations Manager	\$60.45	1.56	\$94.30
Statistician	\$46.72		\$72.88

3.2. Affected Entities and Level of Effort Assumptions

This cost analysis uses estimates of the incremental levels of effort to estimate the costs of certain provisions included in the proposed rule. The cost analysis also includes assumptions about the number of entities that would incur costs complying with each regulatory section related to the GHG measure for which FHWA assumed associated costs. Estimates of the number of entities affected by each of those sections of the proposed rule, and of the level of effort required to comply, are based on interviews with SMEs and data available at the time of the proposed rule, as well as comments submitted during the earlier PM3 rulemaking and the rulemaking that resulted in the repeal of the 2017 GHG Measure.¹⁵ FHWA used these assumptions to conduct its analysis; they are estimated averages for all potentially affected entities and are not determinations of the actual actions which would be taken by all individual entities. The following section identifies each input and provides the source or assumptions used to derive the input data.

The FHWA recognizes that some States and MPOs already use GHG emissions as performance measures (even though Part 490 does not currently include a GHG performance measure), and, as a result, these States and MPOs would not incur all of the costs associated with implementing the proposed GHG measure. These States and MPOs would incur fewer, or no, costs associated with establishing and adjusting targets for the proposed GHG measure, depending on how closely their independently undertaken initiatives and measures align with the requirements for the GHG measure in the proposed rule. Currently, FHWA cannot determine the exact amount of additional effort, if any, that would be required for each individual State and MPO that is independently estimating GHG emissions to take its GHG emissions performance measure being calculated independently of this proposed rule and use it to meet the requirements for the proposed GHG measure. Therefore, for this analysis, FHWA assumes that States and MPOs that are independently estimating GHG emissions to measure performance would not incur any additional costs from establishing and adjusting targets (Section 490.105), estimating total tailpipe CO₂ on the NHS and on all roads (Section 490.511) or calculating the percent change in tailpipe CO₂ emissions on the NHS compared to the reference year (Calendar Year 2021) (Section 490.513).

The FHWA estimates that roughly 10 States and 30 MPOs would not incur costs for these

¹⁵ <https://www.regulations.gov/docket/FHWA-2017-0025/document>

aspects of the GHG measure.^{16, 17, 18} However, even if States and MPOs already have their own GHG performance measures, the costs associated with reporting on performance under Section 490.107 would still apply. Similarly, States could also incur costs under Section 490.109 if they fail to demonstrate significant progress toward their performance targets and consequently are required to document the actions they will take to achieve their targets.

FHWA assumes that smaller MPOs would likely be supported by their State DOTs in implementing the proposed GHG measure. FHWA assumes that MPOs serving areas with populations under 200,000 residents would adopt the targets of their State DOTs (Section 490.105), and would receive assistance from their State DOTs in reporting on performance (Section 490.107), estimating total tailpipe CO₂ emissions on the NHS and on all roads (Section 490.511), and calculating the percent change in tailpipe CO₂ emissions on the NHS compared to the reference year (Section 490.513). FHWA assumes that these MPOs would not incur costs under these provisions.

The FHWA relied on discussions with SMEs and public comments submitted during the previous PM3 rulemaking and in response to the NPRM to repeal the 2017 GHG measure (82 FR 46427, Oct. 5, 2017) to determine the kinds and extent of changes that State DOTs would make in order to comply with the proposed rule. Based on these discussions, FHWA estimated a level of effort required by different kinds of staff at each agency to enact the changes.

Table 3: Section 490.105-109 - Reporting Requirement Assumptions

¹⁶ “A Performance- Based Approach to Addressing Greenhouse Gas Emissions through Transportation Planning” December 2013. This FHWA report provides examples of DOTs and MPOs that have GHG performance measures. Examples include: MD DOT; MassDOT; California MPOs (there are 18 MPOs in CA); Delaware Valley Regional Planning Commission (DVRPC); Genesee Transportation Council; Puget Sound Regional Council.

https://www.fhwa.dot.gov/environment/sustainability/energy/publications/ghg_planning/ghg_planning.pdf
¹⁷ This FHWA Q&A website lists examples of State DOTs and MPOs that currently use GHG analysis in their transportation process. They include: NY State DOT; California DOT; Washington State DOT; Oregon DOT; Metropolitan Transportation Commission (MTC).

https://www.fhwa.dot.gov/environment/sustainability/energy/q_and_a/index.cfm#Toc442091965
¹⁸ Minnesota State: <https://www.pca.state.mn.us/air/greenhouse-gas-emissions-minnesota-0>

Subsection	Variable Name	Unit	Value	Source/Note
Establish and Adjust GHG Targets	All States Affected	States	42	All State DOTs (including Puerto Rico and D.C.) would establish and adjust targets. FHWA estimates that 10 States already measure GHG performance and assumes they would not incur costs as the result of this proposed rule. Consequently, FHWA estimates 42 States would be affected.
	MPOs serving Transportation Management Areas (TMA)s	MPOs	171 ¹⁹	All MPOs would establish targets or accept the targets of their State DOT. FHWA assumes that MPOs serving TMAs (201 MPOs total) would establish their own targets. FHWA estimates that 30 of these MPOs already address GHG emissions and would not incur costs as a result of the proposed rule. FHWA assumes all smaller MPOs (208 total) would agree to the target of their State DOTs and would therefore not incur costs as a result of the proposed rule. Consequently, FHWA estimates that 171 MPOs would be affected.
	States and MPOs Overlapping with Any Portion of a Single Urbanized Area	MPOs	149	MPOs must establish a single joint target for each urbanized area that contains mainline highways on the Interstate or Non-Interstate NHS and that is overlapped by the boundaries of two or more metropolitan planning areas. FHWA assumes that smaller MPOs would agree to the targets of their State and would also use these targets for joint UZA targets, except when such UZAs span two or more States. FHWA estimates there are 19 MPOs in this situation. FHWA estimates there are 130 large MPOs that jointly overlap urbanized areas with at least one other MPO.
	Effective Year		2022	
	Frequency Cycle		2	One-Time, Biennial for State DOTs
			4	One-Time, Every four years for MPOs (both regular MPO targets and joint UZA targets)

Subsection	Variable Name	Unit	Value	Source/Note
	End Year		2031	Based on FHWA professional judgment and discussion with SMEs
	Level of Effort			
	Statistician – One-Time – All States	hours	208	
	Statistician – Recurring – All States	hours	104	
	Statistician – One-Time – All MPOs (regular	hours	208	
	Statistician – Recurring – MPOs (regular targets)	hours	104	
	Statistician Recurring– MPO joint UZA targets	hours	80	FHWA assumes the same level of effort for each 4 year target setting cycle, including the initial year

¹⁹ There are an estimated 409 MPOs. The FHWA estimates the total number of MPOs serving TMAs to be 201. Statewide and Nonmetropolitan Transportation Planning; Metropolitan Transportation Planning. 81 FR 34049. (May 27, 2016).

Subsection	Variable Name	Unit	Value	Source/Note
Reporting on GHG Targets & Progress Toward Them	States Affected	States	52	DOTs for all 50 States, along with Washington, D.C. and Puerto Rico would be affected.
	MPOs Affected	MPOs	201	All MPOs would be subject to the target requirements. FHWA assumes only those MPOs that establish their own performance target would be responsible for separate reporting, with the remainder relying on their State DOTs and not incurring costs.
	Effective Year		2022	
	Frequency Cycle		2	Biennial for State DOTs
			4	Every four years for MPOs
	End Year		2031	
	Level of Effort			FHWA anticipates that the time to incorporate the GHG measure would be 10% of the total time to develop the State's report to FHWA.
	General and Operations Manager – States	Hours	44	
	Statistician – States	Hours	44	
	General and Operations Manager – MPOs	Hours	12	
	Statistician – MPOs	Hours	12	

Develop and Report Plan to Achieve Significant Progress Toward GHG Targets	States Affected (for Percent Change in Tailpipe CO2 Emissions on the NHS Compared to the Reference Year	States	5	FHWA has no current estimates on which to base the number of State DOTs that would fail to meet the test of significant progress. Because State DOTs would have some discretion in the performance targets they establish for themselves, we anticipate only a small number of State DOTs unable to demonstrate significant progress.
	Effective Year		2022	
	Frequency Cycle		2	Every two years beginning with the first Mid Performance Period Progress Report.
	General and Operations Manager - States	Hours	104	
	Statistician – States	Hours	104	

Section 490.511 - Calculation of system performance metric

Subsection	Variable Name	Unit	Value	Source/Note
Calculate Annual Total Tailpipe CO₂ Emissions on the NHS Metric	States Affected	States	42	All 52 DOTs (including PR and DC) would be subject to the requirements. FHWA estimates that 10 States currently measure and calculate GHG performance. It is assumed that these States would not incur costs from this proposed rule. Thus, 42 States would be affected.
	MPOs Affected	MPOs	171	All MPOs would be subject to the requirements. FHWA estimates that 30 MPOs currently measure and calculate GHG performance and assumes that these MPOs would not incur costs from this proposed rule. FHWA also assumes that MPOs outside TMAs would rely on their DOTs for support calculating the performance metric. Thus, 171 MPOs would be affected.
	Effective Year		2022	
	Frequency Cycle		2	Biennial for State DOTs
			4	Every 4 years for MPOs
	End Year		2031	
	Level of Effort			
	Statistician – One-Time Cost for States	Hours	6	
	Statistician – Recurring Cost for States	hours	6	
	Statistician – One-Time Cost for MPOs	Hours	36	
	Statistician – Recurring Cost for MPOs	Hours	36	

Section 490.513 – Calculation of system performance measures

Subsection	Variable Name	Unit	Value	Source/Note
Calculate Percent Change in Tailpipe CO₂ Emissions on the NHS Compared to the Reference Year Level	States Affected	States	42	
	MPOs Affected	MPOs	171	
	Effective Year		2022	
	Frequency Cycle		2	Biennial starting in 2024 for State DOTs
			4	Every 4 years starting in 2026 for MPOs
	End Year		2031	
	Level of Effort			Based on FHWA professional judgment and discussion with SMEs
	Statistician – States	hours	1	
	Statistician – MPOs	hours	1	

4. Costs of the Proposed Rule

This chapter presents the estimated costs of the proposed rule due to the establishment of the GHG measure, which are derived from the costs of implementing the GHG measure for each component of the proposed rule for which FHWA assumed associated costs. The costs associated with the GHG measure are presented by section of the proposed rule as it would amend 23 CFR Part 490.

The economic analysis for this proposed rule only estimates the costs associated with establishing the GHG measure. The aspects of 23 CFR part 490 affected by this proposed rule are definitions (23 CFR 490.101), elements of target establishment by State DOTs and MPOs (490.105), reporting by State DOTs and MPOs (23 CFR 490.107), FHWA's assessment of significant progress toward State DOT targets and action plans by State DOTs that do not make significant progress (23 CFR 490.109), applicability (23 CFR 490.503), calculating the GHG metric (23 CFR 490.511) and measure (23 CFR 490.513). Total costs of this proposed rule are presented at the end of this chapter. FHWA assumed that no costs would be associated with 23 CFR 490.101, 23 CFR 490.503, 23 CFR 490.505, 23 CFR 490.507 or 23 CFR 490.509. Federal costs associated with implementation of the GHG measure are expected to be absorbed through existing programs and data collection systems and are therefore not reflected in this analysis.

4.1. Costs Related to Section 490.105 - Establishment of Performance Targets

The proposed rule would require State DOTs to establish 2- and 4-year performance targets every 4 years (beginning in 2022) with the option to adjust the 4-year target at the midpoint of the performance period, 2 years into the performance period. In the proposed rule, MPOs would be required to establish 4-year targets only, and would have the option to adopt the State DOT target or establish a unique quantifiable target for the metropolitan planning area. This process is discussed in greater detail in Section 2.2 and 23 CFR part 490. In addition, two or more

MPOs overlapping with any portion of a single UZA would additionally be required to set a joint urbanized area target for that UZA.

Inputs

All States and MPOs would be subject to the proposed requirements, but the level of effort would vary. FHWA is aware that some States and MPOs are already measuring GHG performance in some manner. Therefore, in this analysis, the FHWA has assumed that 10 State DOTs (out of 52) and 30 MPOs (out of 201) that serve Transportation Management Areas (TMAs)²⁰ could adapt their existing targets in support of Section 490.105. FHWA assumes that adapting these targets would involve minimal or no cost to these States and MPOs.

Additionally, FHWA believes that only large MPOs serving TMAs are expected to have the staff resources and expertise available to develop their own performance targets. For this analysis, the FHWA assumed that other MPOs would elect to adopt the State DOT target rather than establishing their own GHG performance target and would therefore not incur incremental costs for that target.

For UZA targets, FHWA assumes that smaller MPOs would agree to the targets of their State and would also use these targets for joint UZA targets, except when such UZAs span two or more States. FHWA estimates there are 19 MPOs in this situation. FHWA estimates there are 130 large MPOs that jointly overlap urbanized areas with at least one other MPO and accordingly would set UZA targets.

Table 4 presents the input data for estimating the total marginal costs of target setting activities for the GHG measure.

Table 4: Summary of Inputs for Establishing and Adjusting GHG Performance Targets

Cost Component	Affected Entities	Type of Entity	Labor Category	Level of Effort in Hours Per Entity	Frequency
Establishing and Adjusting Performance Targets for GHG Measure	42	State DOTs	Statistician	208	One-Time
				104	Biennial, Starting 2024
	171	MPOs	Statistician	208	One-Time
				104	Every four years, Starting 2026
	149	MPOs (establishing joint UZA targets)	Statistician	80	Every 4 years Starting 2022

²⁰ A TMA is an urbanized area having a population of over 200,000, or otherwise requested by the Governor and the MPO and officially designated by FHWA and FTA. 23 U.S.C. 134(k).

Cost Estimates

Table 5 shows the marginal cost to State DOTs and MPOs for target setting activities for the proposed GHG Measure. The resulting costs for these activities are \$7.4 million when discounted at 7 percent, and \$8.6 million when discounted at 3 percent.

Table 5: Cost Estimate for Establishing and Adjusting GHG Performance Targets (in 2020 Dollars)

Establish and Adjust Performance Targets	Level of Effort	Loaded Wage Rate	Entities Affected	Years	Total Cost
	a	b	C	D	e = a * b * c * d
1. States performance targets					\$1,959,100
Statistician – All States	208	\$72.88	42	1	\$636,708
	104			4	\$1,322,393
2. MPOs - regular performance targets					\$5,184,619
Statistician – All MPOs	208	\$72.88	171	1	\$2,592,310
	104			2	\$2,592,310
3. MPOs – joint UZA targets					
Statistician – All applicable MPOs	80	\$72.88	149	3	\$2,606,303
Total Costs Discounted at 7%					\$7,442,122
Total Costs Discounted at 3%					\$8,615,050

Note: Totals may not add due to rounding.

4.2. Costs Related to Section 490.107 - Reporting on Performance Targets

The proposed rule would require State DOTs to submit biennial performance reports to FHWA every two years, according to provisions in 23 CFR 490.107. The reporting process is discussed in greater detail in Section 2.2 and 23 CFR part 490.

Inputs

All State DOTs would need to include the proposed GHG measure as part of their biennial reporting process.

Under the proposed rule, MPOs would need to communicate with State DOTs regarding progress toward targets for the GHG measure. The proposed rule does not provide specific requirements for the MPOs to report progress to their State DOT. The process would be developed by the State DOT and the MPO and may not be the same across the nation. FHWA assumed MPOs serving areas with fewer than 200,000 residents would be supported by their

DOTs in reporting on performance, and would thereby not incur reporting costs. FHWA also assumed MPOs serving TMAs would report to State DOTs on the proposed GHG measure in a way that fits into established MPO-State DOT communications. In addition, MPOs would be required to report baseline condition/performance and progress toward the achievement of their targets for the proposed GHG measure in the system performance report in the metropolitan transportation plan in accordance with 23 CFR part 450.²¹ MPOs are required to update their metropolitan transportation plan at least every 4 to 5 years, but may do so more often.²² FHWA assumed that MPOs would need to report on either progress toward targets or target adjustments to State DOTs every four years.

To estimate the costs for reporting on performance targets, FHWA reviewed its estimates prepared for the previous PM3 Final Rule:

- For State DOTs: The analysis for the PM3 Final Rule assumed that the reporting activities for State DOTs (for all seven measures included in that final rule) would take two full-time analysts 220 hours on a biennial basis (or 440 total every two years), a 10 percent increase in annual workload. It also included 440 hours for one project manager to oversee the analysis and report, an approximate 20 percent increase in their annual workload.
- For MPOs: The analysis for the PM3 Final Rule assumed that MPO reporting would require less effort than State DOT reporting, and would require two analysts to spend 60 hours on a biennial basis, an approximate 3 percent increase in annual workloads. The required effort would include 120 hours for one project manager to oversee the analysis and report, an approximate 6 percent increase in annual workload.

For the proposed rule, FHWA allocated 10 percent of the total time to prepare the full report for all measures under PM3 as the marginal time for a State DOT to include the GHG measure in that report. The FHWA arrived at that figure by assuming that 30 percent of the total time needed to develop the report would be needed for administrative tasks, such as internal document reviews, which would not be significantly impacted by the removal of a single measure, and that the remaining 70 percent of the time would be equally divided among each of the seven performance measures. Therefore, for State DOTs, the reporting activities for the GHG measure would require 22 hours each for two statisticians (or 44 hours total) and 44 hours for one project manager every two years. In estimating MPO burden, FHWA similarly allocated 10 percent of the PM3 estimated hours for all measures as an estimate if the marginal time to include the GHG measure. However, it differed from the PM3 analysis in assuming that reporting would occur every four years as opposed to every two years, consistent with the timeframe for the Full Performance Period Progress Report and the update of MPO long range transportation plans. The proposed rule estimates that GHG reporting by MPOs would require a total of 12 hours for a statistician(s) and 12 hours for a project manager, every four years.

Table 6 presents the input data for estimating the total marginal costs for State DOTs and MPOs to meet the reporting requirements for the GHG measure.

²¹ Consistent with the PM3 Final Rule RIA, the costs related to MPO reporting in the metropolitan transportation plan are not included in this analysis. These costs were captured separately in the transportation planning rulemaking, "Update to the Metropolitan and Statewide Planning Regulations" (RIN: 2125-AF52). (<https://www.gpo.gov/fdsys/pkg/FR-2016-05-27/pdf/2016-11964.pdf>).

²² [23 CFR 450.324\(c\)](#)

Table 6: Summary of Inputs for Reporting on GHG Targets

Cost Component	Affected Entities	Type of Entity	Labor Category	Level of Effort in Hours Per Entity	Frequency
Reporting on GHG targets & progress towards them	52	State DOTs	Manager	44	Biennial
			Statistician	44	Biennial
	201	MPOs	Manager	12	Every four years
			Statistician	12	Every four years

Cost Estimates

Table 7 displays the estimates of the biennial cost to State DOTs and MPOs to meet the reporting requirements of the GHG measure. These estimated costs to State DOTs and MPOs equal \$2.3 million when discounted at 7 percent, and \$2.7 million when discounted at 3 percent.

Table 7: Cost Estimate for Reporting on GHG Performance Targets & Progress Toward Targets (in 2020 Dollars)

Reporting on GHG Targets & Progress Toward Them	Level of Effort	Loaded Wage Rate	Entities Affected	Years	Total Cost
	A	B	C	D	e = a * b * c * d
1. States Reporting on GHG Performance Targets & Progress Towards Them					\$1,912,599
General and Operations Manager	44	\$94.30	52	5	\$1,078,815
Statistician	44	\$72.88			\$833,784
2. MPOs Reporting on GHG Performance Targets & Progress Towards Them					\$1,209,752
General and Operations Manager	12	\$94.30	201	3	\$682,369
Statistician	12	\$72.88			\$527,383
Total Costs Discounted at 7%					\$2,272,480
Total Costs Discounted at 3%					\$2,704,007

Note: Totals may not add due to rounding.

4.3. Costs Related to Section 490.109 - Assessing Significant Progress Towards Achieving Performance Targets

The proposed rule would require FHWA to evaluate every 2 years whether State DOTs have achieved, or are making, significant progress toward their performance targets for the GHG measure. If FHWA determines that significant progress was not achieved, then the State DOT

would be required to include the actions it will take to achieve the targets for the proposed GHG measure as part of its next Biennial Performance Report. This process is described in greater detail in Section 2.2.

Inputs

In estimating the total costs of implementing the GHG measure under the proposed rule, FHWA assumed that that five State DOTs would fail to make significant progress for the GHG measure based on interviews with subject matter experts.²³ These States would be required to include in their next Biennial Performance Report a description of the actions they would undertake to achieve the targets. No other estimates for these assumptions were found in the comments submitted in response to the GHG Repeal NPRM.²⁴

The analysis assumes that the effort to develop a plan describing actions the State DOT would take to achieve its GHG target and reporting to FHWA would require 104 hours, for two full-time personnel, a manager and analyst, every two years starting in 2026. The estimate is the same as that presented in the RIA for the PM3 Final Rule for a State DOT to develop a plan for actions to achieve its target related to percent change in tailpipe CO₂ emissions on the NHS compared to the reference year level.

Table 8 presents the input data for estimating the total costs resulting from the need to develop a plan for actions to achieve a target related to percent change in tailpipe CO₂ emissions on the NHS compared to the reference year for those State DOTs that are determined not to be achieving significant progress toward GHG targets.

Table 8: Summary of Inputs for Assessing Significant Progress Toward Achieving GHG Performance Targets

Cost Component	Affected Entities	Type of Entity	Labor Category	Level of Effort in Hours Per Entity	Frequency
Develop plan for actions to achieve GHG target and report to FHWA	5	State DOTs	General and Operations Manager	104	Biennial, Starting 2026
			Statistician	104	Biennial, Starting 2026

Cost Estimates

Table 9 displays the biennial cost estimates for developing improvement plans related to the proposed GHG measure. The total cost to State DOTs to develop and report to FHWA a plan to achieve GHG measure targets would be \$234,377 when discounted at 7 percent, and \$291,868

²³ “Summary Report Economic Assessment: Repeal of Green House Gas Performance Measure Final Rulemaking” (Summary Report Economic Assessment: GHG Repeal Final Rulemaking), § 4.1.3, at 21, Docket No. FHWA-2017-0025 available at: <https://www.regulations.gov/docket/FHWA-2017-0025>.

²⁴ For the GHG Repeal rulemaking, FHWA performed a sensitivity analysis for this variable due to the level of uncertainty with the number of States expected to fail to make significant progress on the Greenhouse Gas Emissions Reduction performance measure. If the analysis were to assume that all 52 State DOTs fail to achieve significant progress on the Greenhouse Gas Emissions Reduction performance measure (a highly unlikely outcome because State DOTs set their own targets), the total cost of the final rule would increase by less than 2 percent. FHWA concluded in the GHG Repeal that the impact this variable has on the overall analysis is insignificant. See Summary Report Economic Assessment: GHG Repeal Final Rulemaking, § 4.1.3, at 21 and n. 28.

when discounted at 3 percent.

Table 9: Cost Estimate for Developing and Reporting State DOT Plan for Achieving GHG Targets to FHWA (in 2020 Dollars)

Develop and Report Plan to Achieve GHG Targets	Level of Effort	Loaded Wage Rate	Entities Affected	Years	Total Cost
	A	B	c	D	e = a * b * c * d
Develop and report plan to achieve GHG targets to FHWA					\$347,745
General and Operations Manager	104	\$94.30	5	4	\$202,384
Statistician	104	\$72.88			\$151,590
Total Costs Discounted at 7%					\$234,377
Total Costs Discounted at 3%					\$291,868

4.4. Costs Related to Section 490.511 - Calculation of System Performance Metric

The proposed rule would establish the GHG performance metric as the Annual Total Tailpipe CO₂ Emissions on the NHS. All State DOTs and MPOs would have to calculate the performance metric, as well as Annual Total Tailpipe CO₂ Emissions on all roads.

Inputs

FHWA estimates that 10 State DOTs are independently estimating on-road tailpipe CO₂ emissions and assumes these States would not incur costs under this Section.²⁵ 42 State DOTs would need to start calculating on-road tailpipe CO₂ emissions on the NHS and on all roads. FHWA assumes this would involve a 6 hours level of effort from an analyst every two years, consistent with the biennial reporting cycle under Section 490.511.

FHWA also assumed that 30 MPOs are independently calculating on-road tailpipe CO₂ emissions and would not incur costs under this Section. Similarly, it is assumed that 208 MPOs serving areas with fewer than 200,000 residents would be supported by their State DOTs in calculating the metric for the GHG measure. The remaining 171 MPOs would calculate the metric. For the proposed rule FHWA estimated that calculating this metric would require a 36-hour level of effort from an analyst every four years, consistent with the assumed cycle for reporting on performance under Section 490.511.

Table 10 presents the input data used to estimate the cost of calculating the Annual Total Tailpipe CO₂ Emissions on the NHS metric.

²⁵ As noted earlier, FHWA cannot determine the exact amount of additional effort, if any, that would be necessary to implement the proposed GHG measure by State DOTs and MPOs that are estimating GHG emissions.

Table 10: Summary of Inputs for GHG Performance Metric

Cost Component	Stage of Process	Affected Entities	Type of Entity	Labor Category	Level of Effort in Hours Per Entity	Frequency
Calculate annual total tailpipe CO ₂ emissions on the NHS	Calculate metric	42	State DOTs	Statistician	6	Biennial
		171	MPOs		36	Every four years

Cost Estimates

Table 11 displays the estimated cost to State DOTs of calculating Annual Total Tailpipe CO₂ Emissions on the NHS. Therefore, the estimated costs from this proposed rule for this activity are \$1.0 million when discounted at 7 percent, and \$1.2 million when discounted at 3 percent.

Table 11: Cost Estimate for Calculating GHG Metric (in 2020 Dollars)

Calculation of GHG Performance Metric	Level of Effort	Loaded Wage Rate	Entities Affected	Years	Total Cost
	a	B	C	D	e = a * b * c * d
1. States calculate Annual Total Tailpipe CO₂ Emissions on the NHS					\$91,833
Statistician	6	\$72.88	42	5	\$91,833
2. MPOs calculate Annual Total Tailpipe CO₂ Emissions on the NHS					\$1,346,007
Statistician	36	\$72.88	171	3	\$1,346,007
Total Costs Discounted at 7%					\$1,049,938
Total Costs Discounted at 3%					\$1,245,987

4.5. Cost Related to Section 490.513 - Calculation of GHG Performance Measure

The proposed rule would require that the GHG measure be calculated every 2 years beginning in 2024 for all States, and every four years beginning in 2026 for all MPOs. The measure is simply the percent change between two numbers (current year and reference year emissions) which are calculated earlier in the metric step. This process is described in greater detail in Section 2.2.

Inputs

For purposes of this economic analysis, the FHWA assumes that only MPOs serving TMAs would calculate performance measure results. State DOT staff would calculate the measure results for smaller MPOs that do not establish their own targets. FHWA estimates 10 States and 30 MPOs are independently addressing GHG emissions, and assumes they would not incur costs associated with the proposed rule.²⁶ Thus, the FHWA assumed that calculation of the GHG measure would take one hour of staff time. Consistent with the assumed reporting cycles identified in Section 490.11, State DOTs would calculate the measure biennially starting in 2024 and MPOs would calculate the measure every four years starting in 2026.

Table 12 presents the input data for calculating the measure.

Table 12: Summary of Inputs for Calculating the GHG Performance Measure

Cost Component	Affected Entities	Type of Entity	Labor Category	Level of Effort in Hours Per Entity	Frequency
Calculate GHG measure	42	State DOTs	Statistician	1	Biennial, starting in 2024
	171	MPOs	Statistician	1	Every 4 years, starting in 2026

Cost Estimates

Table 13 displays the costs which would be incurred by State DOTs and MPOs associated with calculating the proposed GHG performance measure. These costs equal \$23,918 when discounted at 7 percent, and \$30,579 when discounted at 3 percent.

²⁶ FHWA cannot determine the exact amount of additional effort, if any, that would be necessary to implement the proposed GHG measure by State DOTs and MPOs that are estimating GHG emissions.

Table 13: Cost Estimate for Calculating the GHG Performance Measure (in 2020 Dollars)

Calculation of GHG Performance Measure	Level of Effort	Loaded Wage Rate	Entities Affected	Years	Total Cost
	a	B	c	D	e = a * b * c * d
1. States calculate GHG measure					\$12,244
Statistician	1	\$72.68	42	4	\$12,244
2. MPOs calculate GHG measure					\$624,926
Statistician	1	\$72.68	171	2	\$24,926
Total Costs Discounted at 7%					\$23,918
Total Costs Discounted at 3%					\$30,579

4.6. Total Costs of the Proposed Rule

Table 14 displays the total costs of this proposed rule for the 10-year study period (2022–2031). The total costs are estimated to be \$11.0 million discounted at 7 percent and \$12.9 million discounted at 3 percent. The table also displays the average annual costs for each discounted total.

Table 14: Total Cost of the NPRM (in 2020 Dollars)

Cost Components	10-Year Total Cost		Annualized Cost	
	7%	3%	7%	3%
Section 490.105 - 490.109 - Reporting Requirements	\$9,948,979	\$11,610,925	\$1,416,511	\$1,361,155
Establish and Adjust GHG Targets	\$7,442,122	\$8,615,050	\$1,059,591	\$1,009,947
Report on GHG Targets & Progress Toward Them	\$2,272,480	\$2,704,007	\$323,550	\$316,992
Develop and Report Plan to Achieve GHG Targets	\$234,377	\$291,868	\$33,370	\$34,216
Section 490.511 – GHG Metric Calculation	\$1,049,938	\$1,245,987	\$149,488	\$146,068
Calculate Annual Total Tailpipe CO ₂ Emissions on the NHS	\$1,049,938	\$1,245,987	\$149,488	\$146,068
Section 490.513 - Calculation of GHG Performance Measure	\$23,918	\$30,579	\$3,405	\$3,585
Calculate % Change in Tailpipe CO ₂ Emissions the NHS Compared to the Reference Year Level	\$23,918	\$30,579	\$3,405	\$3,585
Total Cost of Final Rule	\$11,022,835	\$12,887,491	\$1,569,404	\$1,510,807

Note: Totals may not add due to rounding.

5. Cost Savings of the Proposed Rule

The proposed rule may support certain aspects of State DOT and MPO missions, and thereby result in cost savings that offset some portion of the burden from the proposed rule. For example, the work that would be done by States and MPOs to establish, report, and calculate GHG performance targets could support forecasting fuel tax revenues to help formulate transportation budgets, or support consideration of energy conservation under 23 CFR 450.306. The FHWA currently has no basis to quantify this potential cost savings, and requests information from the public that could be used to quantify these potential cost savings at the final rule stage.

6. Benefits of the Proposed Rule

This section presents a qualitative discussion of potential benefits of this proposed rule due to establishing the GHG measure.

Before the Transportation Performance Management program was implemented, State DOTs

differed in the way they evaluated the performance of the NHS. These differences hinder accurate analysis at the national level. The performance management program established in 23 CFR Part 490 uniform national performance measures, as well as processes that: (1) State DOTs and MPOs use to report national measure information and establish performance targets; and (2) FHWA uses to assess progress that State DOTs have made toward achieving targets.

Together with the other existing performance measures, the proposed GHG measure would align with current requirements, goals, and processes under transportation planning requirements. In particular, transportation performance management requirements have provided increased accountability and transparency, facilitating efficient investment of Federal transportation funds through a focus on performance outcomes for other national transportation goals. See 23 U.S.C. 150(b). Including a GHG measure in this way could promote greater efficiency by assuring that GHG emissions are consistently and collaboratively considered by State DOTs and MPOs through transportation planning and performance management, rather than being addressed as an ad hoc consideration by a limited number of organizations. Inclusion of a GHG measure could also promote greater efficiency in the allocation of transportation funds since investment decisions would be more likely to consider GHG emissions as a factor in evaluating projects, rather than focusing on a narrower set of decision criteria.

The proposed rule provides for no increase in funds for transportation projects. Thus, the rule may result in some offsetting loss of benefits from investment projects that would no longer be pursued, if funds are shifted toward other projects as a result of the rule. However, the benefits that may possibly flow from the GHG measure in the proposed rule come from its potential to support more informed choices about transportation investments and other policies to help achieve net zero emissions economy-wide by 2050, including projects eligible under the Carbon Reduction Program and the National Electric Vehicle Infrastructure Program, both established under the Bipartisan Infrastructure Law (BIL), enacted as the Infrastructure Investment and Jobs Act (Pub. L. 117-58, Nov. 15, 2021).²⁷ Reporting of GHG emissions and setting of GHG emissions targets would increase public awareness of GHG emissions trends, promote the consideration of GHG emissions in transportation planning decisions, and more transparently characterize the impact of these decisions on GHG emissions. These benefits are not easily quantifiable.

While it is not possible to conclude with any degree of certainty that the GHG measure might cause State DOTs and MPOs to make transportation-investment and operations decisions that they otherwise would not have made, FHWA acknowledges the potential benefits that could flow from this action, including the following:

- **More Informed Decision-making:** A driving purpose of this proposed rule is to generate information that has the potential to improve decision-making. Decisions regarding State and local projects, programs, and policy choices can be made more efficiently and also improved as a result of two factors:
 - **Consistency Among States in Assessing GHG Emissions** – GHG emissions from on-road transportation can be assessed using a range of different approaches. These include potential differences in the

²⁷ Carbon Reduction Program (CRP) Implementation Guidance (April 21, 2022), available at https://www.fhwa.dot.gov/environment/sustainability/energy/policy/crp_guidance.pdf; The National Electric Vehicle Infrastructure (NEVI) Formula Program Guidance (February 10, 2022), available at https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/nominations/90d_nevi_formula_program_guidance.pdf.

greenhouse gases that are addressed; the potential inclusion of lifecycle processes beyond tailpipe processes, and the potential use of different reporting units. By creating a uniform approach to analyzing GHG emissions, the proposed rule would create a structure that would increase consistency among States in how they track and report the GHG emissions of their systems. The uniform approach would also support E.O.14008 by allowing targets or performance data to be summed across States in support of national commitments, including a nationally determined contribution to global GHG reductions as part of the Paris agreement and the U.S. target to reduce emissions 50-52 percent by 2030 compared to 2005 levels, as discussed in the preamble to the proposed rule.

- **More Comprehensive Performance Data and Practices** – A key premise underling the proposed GHG measure is that measuring and reporting complete, consistent, and timely information on GHG emissions from on-road mobile source emissions will offer opportunities for all levels of government and the public to make more informed choices by including GHG emissions as a consideration in transportation decisionmaking. With improved data addressing GHG emissions, State DOTs and MPOs would have more complete information to include in their planning processes and to guide future investment decisions.
- **Greater Accountability:** Reporting, including under this proposed rule, increases States' accountability for their performance by providing a more highly visible and transparent performance reporting system than existed prior to MAP-21. As States collectively experience more public scrutiny regarding the performance of the NHS, transportation leaders can be expected to increase their efforts to reduce CO₂ emissions.
- **Progress on National Transportation Goals:** The proposed GHG measure, including the requirement that State DOTs and MPOs establish improving targets for reducing tailpipe CO₂ emissions on the NHS, is one element of a broader set of existing performance requirements designed to help focus the Federal-aid highway program on achieving balanced performance outcomes and national climate policies.

The FHWA expects that the proposed rule could also lead to some efficiency in the estimation of CO₂ emissions, setting of targets and the evaluation of strategies to reduce CO₂ emissions through the development of consulting services or specialized tools that would support State DOTs and MPOs. However, FHWA does not currently have sufficient information to determine the likelihood of such efficiencies or the magnitude of their benefits. The FHWA requests data and information that could possibly be used to make quantitative estimates of these potential benefits at the final rule stage.

7. Break-even Analysis of the Proposed Rule

The potential benefits resulting from the proposed rule discussed above (e.g., information that has the potential to lead to more informed decision-making, greater accountability, and the focus on making progress toward the national goals for environmental sustainability through improving targets) will lead to an enhanced performance of the NHS. The reasoning behind this assertion is that what gets measured gets improved.

The benefits of the proposed rule would depend on whether and how State DOTs and MPOs shift their investment decisions as a result of the requirements of the rule. The potential benefits are difficult to forecast, quantify, and monetize. The FHWA addresses this issue using the break-even analysis method suggested by OMB Circular A-4 (Regulatory Analysis):

It will not always be possible to express in monetary units all of the important benefits and costs. When it is not, the most efficient alternative will not necessarily be the one with the largest quantified and monetized net-benefit estimate. In such cases, you should exercise professional judgment in determining how important the non-quantified benefits or costs may be in the context of the overall analysis. If the non-quantified benefits and costs are likely to be important, you should carry out a “threshold” analysis to evaluate their significance. Threshold or “break-even” analysis answers the question, “How small could the value of the non-quantified benefits be (or how large would the value of the non-quantified costs need to be) before the rule would yield zero net benefits?”²⁸

Because there are challenges associated with estimating the benefits of this proposed rule, FHWA uses break-even analysis to provide context around the level of benefits required for the rule to reach zero-net benefits and break-even. Break-even analysis calculates the threshold a specific variable (the level that benefits) must achieve in order to equal costs while holding every other variable in the analysis constant. The calculated threshold (benefits) serves as an approximate value for comparison to expected outcomes (estimated costs) of the requirements of the proposed rule being analyzed in this RIA. The threshold does not quantify the direct benefits that will be achieved by this proposed rule.

This proposed rule provides for no increase in funds for transportation projects. The benefits that would accrue from the proposed rule would come from a more optimal allocation of resources based on better data, national reporting, and increased accountability. The allocation of resources a State DOT or MPO would make could result in project programming decisions that would differ from those they would have otherwise made in the absence of the requirements in this proposed rule. The changes in project-level investment decision-making are not directly reflected in this evaluation, as our break-even analysis is focused on network-level improvements. While FHWA expects that any re-allocation of resources would increase overall benefits, FHWA acknowledges that the benefits resulting from specific projects would be delayed if the re-allocation would result in delays of these projects. The FHWA expects, however, that the net benefits resulting from any re-allocation would be higher than the net benefits without the re-allocation. Therefore, the analysis does not consider the loss of benefit from any projects that are delayed by a State DOT or MPO because FHWA does not anticipate an overall loss resulting from choosing to implement a more beneficial project ahead of one that is less beneficial toward achieving targets.

For this proposed rule, FHWA estimates a break-even threshold for tons of transportation-related CO₂ emissions. The FHWA selected this variable because it is reasonable to assume that the GHG performance measure will influence tons of transportation-related CO₂ emissions variables relative to current baseline levels.

As discussed in Section 4 above, the total cost the proposed rule is \$11.0 million or \$12.9 million at 7 and 3 percent discount rates, respectively. To calculate the number of tons of CO₂ emissions that would need to be avoided for the rule to break even, FHWA divided the total cost of the proposed rule by the annual Interagency Working Group (IWG) social cost of carbon (SC-

²⁸ <https://www.federalregister.gov/documents/2003/10/09/03-25606/circular-a-4-regulatory-analysis>

CO₂) for 5, 3, and 2.5 percent, as well as 3 percent 95th percentile, and discounting them back to 2020.²⁹ The SC-CO₂ is a representation of the monetary value of the damages to society resulting from adding a small amount of CO₂ emissions to the atmosphere in a given year.

IWG on Social Cost of Greenhouse Gases recently published interim estimated values for the SC-CO₂ per ton of carbon emissions for each year from 2020 to 2050. As noted by the IWG's technical support document prepared under E.O. 13990, the SC-CO₂ framework in principle can capture all climate change impacts, including (but not limited to) changes in net agricultural productivity, human health effects, property damage from increased flood risk natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. However, many important categories of climate damages cannot currently be fully quantified and monetized, and so the SC-CO₂ values very likely underestimate the climate damages caused by greenhouse gas pollution. The IWG's technical support document further notes that the SC-CO₂ as estimated should reflect the societal value of reducing CO₂ emissions by one metric ton, and that the SC-CO₂ is the theoretically appropriate value to use in conducting economic analyses of policies that affect CO₂ emissions.³⁰ The Department of Transportation is an IWG member, and FHWA has reviewed the technical support document and has determined that the recommended values are appropriate for use in this illustrative break-even analysis.

The SC-CO₂ estimates presented here were developed over many years, using transparent process, peer-reviewed methodologies, the best science available at the time of that process, and with input from the public. Specifically, in 2009, an interagency working group (IWG) was established to ensure that agencies were using the best available science and to promote consistency in the SC-CO₂ values used across agencies. The IWG published SC-CO₂ estimates in 2010 that were developed from an ensemble of three widely cited integrated assessment models (IAMs) that estimate global climate damages using highly aggregated representations of climate processes and the global economy combined into a single modeling framework. The three IAMs were run using a common set of input assumptions in each model for future population, economic, and CO₂ emissions growth, as well as equilibrium climate sensitivity (ECS) – a measure of the globally averaged temperature response to increased atmospheric CO₂ concentrations. These estimates were updated in 2013 based on new versions of each IAM.³¹ In August 2016 the IWG published estimates of the social cost of methane (SC-CH₄) and nitrous oxide (SC-N₂O) using methodologies that are consistent with the methodology underlying the SC-CO₂ estimates. In 2015, as part of the response to public comments received to a 2013 solicitation for comments on the SC-CO₂ estimates, the IWG announced a National Academies of Sciences, Engineering, and Medicine review of the SC-CO₂ estimates to offer advice on how to approach future updates to ensure that the estimates continue to reflect the best available science and methodologies. In January 2017, the National Academies released their final report, *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide*, and recommended specific criteria for future updates to the SC-CO₂ estimates, a modeling framework to satisfy the specified criteria, and both near-term updates and longer-

²⁹ Note that the SC-CO₂ values increase over time because future emissions produce larger incremental damages as physical and economic systems become more stressed in response to greater climatic change, and because GDP is growing over time and many damage categories are proportional to GDP.

³⁰ Interagency Working Group on the Social Cost of Greenhouse Gases. 2021. Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide: Interim Estimates under Executive Order 13990. Available at: https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.

³¹ Dynamic Integrated Climate and Economy (DICE) 2010 (Nordhaus 2010), Climate Framework for Uncertainty, Negotiation, and Distribution (FUND) 3.8 (Anthoff and Tol 2013a, 2013b), and Policy Analysis of the Greenhouse Gas Effect (PAGE) 2009 (Hope 2013).

term research needs pertaining to various components of the estimation process (National Academies, 2017). Shortly thereafter, in March 2017, President Trump issued Executive Order 13783, which disbanded the IWG and withdrew the previous TSDs. On January 20, 2021, President Biden issued Executive Order 13990, which re-established the IWG and directed it to develop estimates of the social cost of carbon and other greenhouse gases that reflect the best available science and the recommendations of the National Academies (2017). The IWG was tasked with first reviewing the SC-GHG estimates currently used in Federal analyses and publishing interim estimates within 30 days of the E.O. that reflect the full impact of GHG emissions, including by taking global damages into account. The interim SC-GHG estimates were published in February 2021.

The February 2021 TSD provides a complete discussion of the IWG's initial review conducted under E.O. 13990. In particular, the IWG found that the SC-GHG estimates used under E.O. 13783 fail to reflect the full impact of GHG emissions in multiple ways. First, the IWG found that a global perspective is essential for SC-GHG estimates because climate impacts occurring outside U.S. borders can directly and indirectly affect the welfare of U.S. citizens and residents. Thus, U.S. interests are affected by the climate impacts that occur outside U.S. borders. Examples of affected interests include direct effects on U.S. citizens and assets located abroad, international trade, and tourism, and spillover pathways such as economic and political destabilization and global migration. In addition, assessing the benefits of U.S. GHG mitigation activities requires consideration of how those actions may affect mitigation activities by other countries, as those international mitigation actions will provide a benefit to U.S. citizens and residents by mitigating climate impacts that affect U.S. citizens and residents. Second, the IWG found that the use of the social rate of return on capital to discount the future benefits of reducing GHG emissions inappropriately underestimates the impacts of climate change for the purposes of estimating the SC-GHG. Consistent with the findings of the National Academies (2017) and the economic literature, the IWG continues to conclude that the consumption rate of interest is the theoretically appropriate discount rate in an intergenerational context and when future climate damages are estimated in consumption-equivalent units (IWG 2010, 2013, 2016). The IWG provides estimates of the SC-CO₂ using consumption-based discount rates of 5, 3, and 2.5 percent, which aligns with discount rates used for estimates of the SC-CO₂ between 2010 and 2016. The IWG also notes that, due to the intergenerational nature of the damages caused by CO₂ emissions, new data and evidence strongly suggests that the most appropriate discount for estimating the SC-CO₂ should be even lower than 2.5 percent.³²

For each discount rate, the IWG combined the distributions across models and socioeconomic emissions scenarios (applying equal weight to each) and then selected a set of four values for use in benefit-cost analyses: an average value resulting from the model runs for each of three discount rates (2.5 percent, 3 percent, and 5 percent), plus a fourth value, selected as the 95th percentile of estimates based on a 3 percent discount rate. The fourth value was included to provide information on potentially higher-than-expected economic impacts from climate change, conditional on the 3 percent estimate of the discount rate. As explained in the February 2021 TSD, this update reflects the immediate need to have an operational SC-GHG for use in regulatory benefit-cost analyses and other applications that was developed using a transparent process, peer-reviewed methodologies, and the science available at the time of that process. Those estimates were subject to public comment in the context of dozens of proposed rulemakings as well as in a dedicated public comment period in 2013.

³² For more details on the justifications for the current approach to discounting, see Interagency Working Group on the Social Cost of Greenhouse Gases. 2021. Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide: Interim Estimates under Executive Order 13990. Available at: https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.

The interim SC-CO₂ estimates used in this illustrative breakeven analysis have a number of limitations. First, the current scientific and economic understanding of discounting approaches suggests discount rates appropriate for intergenerational analysis in the context of climate change are likely to be less than 3 percent, near 2 percent or lower (IWG, 2021). Second, the IAMs used to produce these interim estimates do not include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature and the science underlying their “damage functions” – i.e., the core parts of the IAMs that map global mean temperature changes and other physical impacts of climate change into economic (both market and nonmarket) damages – lags behind the most recent research. For example, limitations include the incomplete treatment of catastrophic and non-catastrophic impacts in the integrated assessment models, their incomplete treatment of adaptation and technological change, the incomplete way in which inter-regional and intersectoral linkages are modeled, uncertainty in the extrapolation of damages to high temperatures, and inadequate representation of the relationship between the discount rate and uncertainty in economic growth over long time horizons. Likewise, the socioeconomic and emissions scenarios used as inputs to the models do not reflect new information from the last decade of scenario generation or the full range of projections.

The modeling limitations do not all work in the same direction in terms of their influence on the SC-GHG estimates. However, the IWG has recommended and the FHWA affirms that, taken together, the limitations suggest that the interim SC-GHG estimates used in this proposed rule likely underestimate the damages from GHG emissions. In particular, the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (IPCC, 2007), which was the most current IPCC assessment available at the time when the IWG decision over the ECS input was made, concluded that SC-CO₂ estimates “very likely...underestimate the damage costs” due to omitted impacts. Since then, the peer-reviewed literature has continued to support this conclusion, as noted in the IPCC’s Fifth Assessment report (IPCC, 2014) and other recent scientific assessments (e.g., IPCC 2018, 2019a, 2019b; U.S. Global Change Research Program (USGCRP) 2016, 2018; and National Academies 2016b, 2019). These assessments confirm and strengthen the science, updating projections of future climate change and documenting and attributing ongoing changes.

Table 15 and Table 16 show the CO₂ emissions that the proposed rule would need to save in order to be cost-beneficial under each of three discount rates used to estimate the SC-CO₂ when the costs of the rule are discounted at 7 and 3 percent. For the purpose of the break-even analysis, FHWA assessed the SC-CO₂ value for each year with estimated costs, by using the annual IWG SC-CO₂ values for 5, 3, and 2.5 percent, as well as 3 percent 95th percentile, and discounting them back to 2020. Using these discounted SC-CO₂ values, FHWA estimated the annual breakeven CO₂ tonnages which could then be summed and averaged over the 10-year period. At a discount rate of 7 percent, the number of tons of CO₂ emissions that would be required for the proposed rule to be cost-beneficial range from 150,469 to 835,044 over the total 10-year analysis period, or from 16,719 to 92,783 on an annual basis. Similarly, at a discount rate of 3 percent, the total number of tons of CO₂ emissions that would be required for the proposed rule to be cost-beneficial range from 176,528 to 983,896 over the total 10-year analysis period, or from 19,614 to 109,322 on an annual basis. Table 15 and Table 16 also show the required reductions in tons of CO₂ emissions for the proposed rule to be cost-beneficial on an annual basis. Data from the U.S. Environmental Protection Agency indicates that the transportation sector emitted approximately 1.88 billion tons of CO₂ in 2019.³³ The

³³ In 2018, the transportation sector accounted for 1.88 billion tons of CO₂ emissions, according to the EPA’s Greenhouse Gas Inventory Data Explorer. Available online at: <https://cfpub.epa.gov/ghgdata/inventoryexplorer/#allsectors/allgas/econsect/current>.

required reductions in annual CO₂ emissions for the proposed rule to break even represent less than 0.01 percent of the average annual amount of 2019 CO₂ emissions from transportation sources under all three discount rates used for estimating the SC-CO₂, and also under both the 7 and 3 percent discount rates used to estimate the total costs of the proposed rule.

Table 15: Break-even Analysis of the NPRM at a 7 Percent Discount Rate (in 2020 Dollars)

Break-even Scenario	Total 10 - Year Costs of the Proposed Rule at a 7% Discount Rate	Total Reduction in Tons of CO₂ Emissions for the Proposed Rule to Break-Even	Annual Reduction in Tons of CO₂ Emissions for the Proposed Rule to be Cost-beneficial
5% Discount Rate for SC-CO ₂	\$11,022,835	835,044	83,504
3% Discount Rate for SC-CO ₂	\$11,022,835	226,786	22,679
2.5% Discount Rate for SC-CO ₂	\$11,022,835	150,469	15,047
3% 95th Percentile Discount Rate for SC-CO ₂	\$11,022,835	75,669	7,567

Table 16: Break-even Analysis of the NPRM at a 3 Percent Discount Rate (in 2020 Dollars)

Break-even Scenario	Total 10 - Year Costs of the Proposed Rule at a 3% Discount Rate	Total Reduction in Tons of CO₂ Emissions for the Proposed Rule to be Cost-beneficial	Annual Reduction in Tons of CO₂ Emissions for the Proposed Rule to be Cost-beneficial
5% Discount Rate for SC-CO ₂	\$12,887,491	983,896	98,390
3% Discount Rate for SC-CO ₂	\$12,887,491	266,238	26,624
2.5% Discount Rate for SC-CO ₂	\$12,887,491	176,528	17,653
3% 95th Percentile Discount Rate for SC-CO ₂	\$12,887,491	88,772	8,877

8. Regulatory Flexibility Act

In compliance with the Regulatory Flexibility Act (Pub. L. 96-354, 5 U.S.C. 601-612), FHWA has evaluated the effects of this proposed rule on small entities and has determined that it is not anticipated to have a significant economic impact on a substantial number of small entities. The proposed rule would affect State governments and MPOs. State governments are not included in the definition of small entity set forth in 5 U.S.C. 601. The MPOs are considered governmental jurisdictions, and to qualify as a small entity they would need to serve fewer than 50,000 people. The MPOs are designated to serve urbanized areas with populations of 50,000 or more. See 23 U.S.C. 134(d)(1). Therefore, FHWA certifies that the proposed rule will not have a significant economic impact on a substantial number of small entities.

Appendix A: Year-by-Year Costs

This Appendix presents the estimated costs for the proposed role for each year of the ten-year analysis period at discount rates of both 7 and 3 percent.

Table 17: Total Costs of the Proposed Rule at a 7 Percent Discount Rate (in 2020 Dollars)

Cost Components	Costs Discounted at 7%									
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Section 490.105 - 490.109 - Reporting Requirements	\$4,564,071	\$0	\$653,083	\$0	\$2,401,500	\$0	\$498,234	\$0	\$1,832,093	\$0
Establish and Adjust Performance Targets	\$3,829,706	\$0	\$269,867	\$0	\$1,779,272	\$0	\$205,880	\$0	\$1,357,398	\$0
Report on GHG Targets & Progress Toward Them	\$734,365	\$0	\$312,250	\$0	\$560,243	\$0	\$238,214	\$0	\$427,407	\$0
Develop and Report Plan to Achieve GHG Targets	\$0	\$0	\$70,966	\$0	\$61,984	\$0	\$54,140	\$0	\$47,288	\$0
Section 490.511 - GHG Metric Calculation	\$436,482	\$0	\$14,993	\$0	\$332,990	\$0	\$11,438	\$0	\$254,036	\$0
Calculate Annual Total Tailpipe CO ₂ Emissions on the NHS	\$436,482	\$0	\$14,993	\$0	\$332,990	\$0	\$11,438	\$0	\$254,036	\$0
Section 490.513 - Calculation of GHG Performance Measure	\$0	\$0	\$2,499	\$0	\$11,068	\$0	\$1,906	\$0	\$8,444	\$0
Calculate % Change in Tailpipe CO ₂ Emissions the NHS Compared to the Reference Year Level	\$0	\$0	\$2,499	\$0	\$11,068	\$0	\$1,906	\$0	\$8,444	\$0
Total Cost of Final Rule	\$5,000,552	\$0	\$670,574	\$0	\$2,745,558	\$0	\$511,578	\$0	\$2,094,573	\$0

Table 18: Total Costs of the Proposed Rule at a 3 Percent Discount Rate (in 2020 Dollars)

Cost Components	Costs Discounted at 3%									
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Section 490.105 - 490.109 - Reporting Requirements	\$4,741,316	\$0	\$732,163	\$0	\$2,905,463	\$0	\$650,517	\$0	\$2,581,466	\$0
Establish and Adjust GHG Targets	\$3,978,432	\$0	\$302,544	\$0	\$2,152,658	\$0	\$268,807	\$0	\$1,912,609	\$0
Report on GHG Targets & Progress Toward Them	\$762,884	\$0	\$350,060	\$0	\$677,812	\$0	\$311,024	\$0	\$602,228	\$0
Develop and Report Plan to Achieve GHG Targets	\$0	\$0	\$79,559	\$0	\$74,992	\$0	\$70,687	\$0	\$66,629	\$0
Section 490.511 - GHG Metric Calculation	\$453,433	\$0	\$16,808	\$0	\$402,869	\$0	\$14,934	\$0	\$357,944	\$0
Calculate Annual Total Tailpipe CO ₂ Emissions on the NHS	\$453,433	\$0	\$16,808	\$0	\$402,869	\$0	\$14,934	\$0	\$357,944	\$0
Section 490.513 - Calculation of GHG Performance Measure	\$0	\$0	\$2,801	\$0	\$13,391	\$0	\$2,489	\$0	\$11,898	\$0
Calculate % Change in Tailpipe CO ₂ Emissions the NHS Compared to the Reference Year Level	\$0	\$0	\$2,801	\$0	\$13,391	\$0	\$2,489	\$0	\$11,898	\$0
Total Cost of Final Rule	\$5,194,749	\$0	\$751,772	\$0	\$3,321,723	\$0	\$667,940	\$0	\$2,951,308	\$0